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Glaciological and Marine Biological Studies at  
Perimeter of Dronning Maud Land, Antarctica  
Investigation No. 28550

Report  
from  
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MAUD LAND, ANTARCTICA Progress Report  
(Norsk Polarinstitutt) 5 p HC \$3.50  
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Original photography may be purchased from:  
EROS Data Center  
10th and Dakota Avenue  
Sioux Falls, SD 57198

## INTRODUCTION

The overall objective of this investigation is to utilize Landsat imagery to a) analyze changes in the Dronning Maud Land coastline, and to obtain statistical data on b) ocean dynamics, c) plankton distribution, and d) sea ice and iceberg distribution in this part of Antarctica.

An early problem with this investigation was lack of imagery from the test area. However, during the past three months we have received 54 scenes, and this data set has allowed work to be started on all objectives.

## RESULTS

### a) Coast line

The map, Fig. 1, was presented with the previous QPR for this project, dated 24 March 1976. As shown the coastline could not then be delineated in all areas, partly because of lack of imagery, and partly because of difficulties in distinguishing fast ice from the ice shelf.

Both of these difficulties are being overcome. Imagery recently received have covered most of the missing areas, so that we now have a nearly-complete cloud-free coverage of the coast between  $2^{\circ}\text{W}$ . and  $30^{\circ}\text{E}$ . The second problem is being solved by making overexposed copies of the MSS 7 imagery. We have found that making copies at 5-10 times "normal" exposure brings out the fast ice/ice shelf boundary. This is illustrated in Fig. 2. The boundary is not recorded in the other MSS bands, nor can it be seen easily in the negatives of MSS 7. Recognition of the fast ice/ice shelf boundary is essential in order to determine the coast line, and thus obtain data on the outward movement of the ice shelves, and hence the mass flux.

An added result of the overexposing technique has been the discovery of several previously unknown ice rises. This is illustrated in Fig. 3, these ice rises are only slightly above the general surface of the ice shelf, and are very difficult to see from ground level. They promise to be important sites for drilling to obtain ice cores for paleoclimatic studies, because the ice rises may have occupied fairly constant positions

over long time periods. It is therefore important to identify all the ice rises, and Landsat seems an excellent tool for this purpose.

Work is now in progress to make an accurate map of the coastline to scale of 1:500 000. Also to be depicted will be all the different coastline positions with time.

b) Only two of the recently received imageries have allowed determination of drift velocities, namely Nos. 2330-07130 and 2331-07181, taken on 18 and 19 December 1975. Drift velocities of between 12 and 20 km/day were computed, with most determinations in the lower range. The ice was moving westwards near the coast at 7°E. These velocities are a little higher than those reported in the second QPR. More imagery close in time of nearby areas would allow more extensive determinations of drift velocities by this technique.

c) Plankton sheets have been searched for mostly by attempting to find areas within the open sea that stand out in the MSS 4 and 5 bands, but are not distinguishable from the sea in MSS 6 and 7. The results have so far been inconclusive. However, we have still not received the desired imagery for this particular study. From biological work we know that the large plankton concentrations are found mostly from January to March, and we have not yet received imagery of large open areas of the sea from this period. The Landsat catalogue NTISUB/B/139-76/002 indicates that such imagery has now been obtained, and we plan to place more emphasis on this particular problem as soon as useful imagery arrives here.

d) Some work has been done on sea ice and iceberg distribution, particularly related to distinguishing these two ice types.

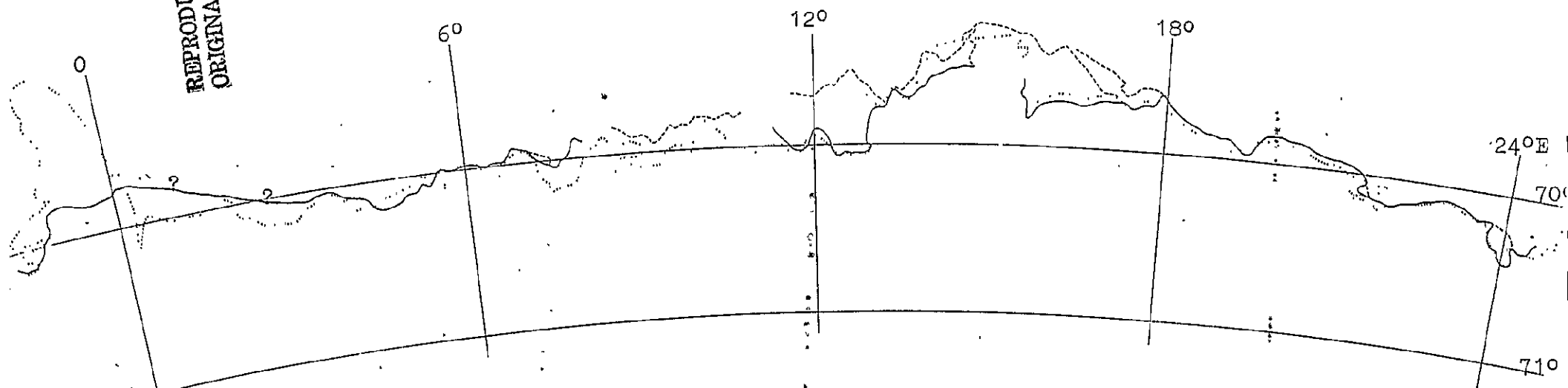
#### CONCLUSIONS

The imagery now received is of excellent quality, and we are progressing on all objectives of this investigation.

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Dronning Maud Land, Antarctica

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Solid line = Coast line determined from LANDSAT imagery

Dotted line = Coast line determined mostly from Norsk Polarinstitutt's 1951/52 and 58/59 air photography

Dashed line = Outer limit fast ice at time of photography/imagery

Scale:

0 100 200 km

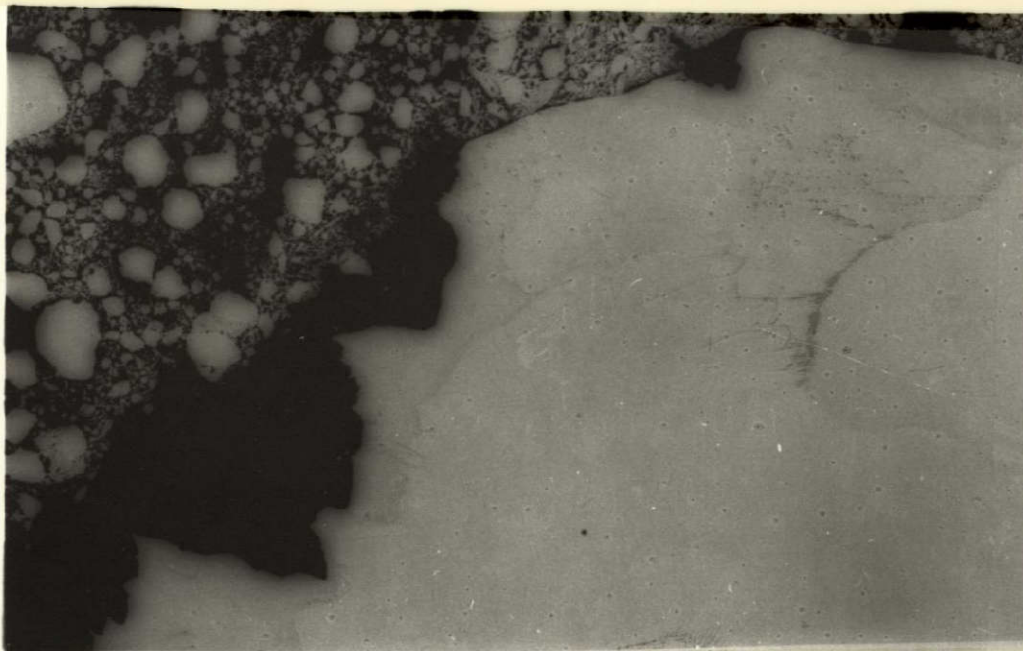


Fig. 2.

Part of Landsat imagery 2308-06495, MSS 7, showing the fast ice/ice shelf boundary between about  $13^{\circ}$  and  $17^{\circ}$ E. Figs. 2 and 3 are exposed about 7 x "normal" and at scale of 1:1.25 mill.



Fig. 3.

Part of Landsat imagery 2278-07250, MSS 7, showing five ice rises between about  $2^{\circ}$  and  $7^{\circ}$ E. The two smallest of these were not noticed when the imagery were first made with "normal" exposure.

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